IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the

application:

Listing of Claims:

Claim 1 (Previously Presented): A noise suppression device comprising:

a time to frequency converter configured to perform frequency analyzation of an input

time domain signal for conversion to an amplitude spectrum;

a noise spectrum unit configured to obtain a noise spectrum of the input time domain

signal;

a signal to noise calculator configured to obtain a signal to noise ratio from the

amplitude spectrum and the noise spectrum;

a perceptual weight controller configured to control, based on the signal to noise ratio,

first and second perceptual weights;

a spectrum subtracter configured to subtract from said amplitude spectrum a product

of said noise spectrum and the first perceptual weight as controlled by said perceptual weight

controller;

a spectrum amplitude suppressor configured to multiply a spectrum obtained from

said spectrum subtracter by the second perceptual weight as controlled by said perceptual

weight controller; and

a frequency to time converter configured to convert an output of said spectrum

amplitude suppressor to a time domain signal.

Claim 2 (Previously Presented): The noise suppression device as recited in claim 1,

wherein said perceptual weight controller is operable to let said first and second perceptual

weights become larger at certain frequencies with increased signal to noise ratios while

letting said first and second perceptual weights be smaller at frequencies with reduced signal

to noise ratios.

Claim 3 (Previously Presented): The noise suppression device as recited in claim 1,

further comprising: a perceptual weight modifier configured to modify at least one of the first

and second perceptual weights at a ratio of a high frequency power to a low frequency power

of any one of an input signal amplitude spectrum, a noise spectrum, and an average spectrum

of the input signal amplitude spectrum and the noise spectrum.

Claim 4 (Previously Presented): The noise suppression device as recited in claim 1,

further comprising: a perceptual weight modifier configured to modify the first and second

perceptual weights based on a determination result as to whether an input signal is a noise or

an audio component.

Claim 5 (Previously Presented): The noise suppression device as recited in claim 1,

wherein the spectrum subtracter is further configured to perform fill-up processing, when a

subtraction result of said spectrum subtracter is negative or zero, to a spectrum obtained by

multiplying a third perceptual weight to a specified spectrum.

Claim 6 (Original): The noise suppression device as recited in claim 5, wherein said

specified spectrum is one of an input signal amplitude spectrum, a noise spectrum, and an

average spectrum of the input amplitude spectrum and the noise spectrum.

Claim 7 (Previously Presented): The noise suppression device as recited in claim 5,

further comprising means for modifying the third perceptual weight at a ratio of a high

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frequency power to a low frequency power of at least one of an input signal amplitude

spectrum, a noise spectrum, and an average spectrum of the input signal amplitude spectrum

and the noise spectrum.

Claim 8 (Previously Presented): The noise suppression device as recited in claim 5,

further comprising means for controlling the third perceptual weight on the signal to noise

ratio.

Claim 9 (Previously Presented): The noise suppression device as recited in claim 5,

further comprising a perceptual weight adjuster configured to adjust the third perceptual

weight in value through multiplication of a ratio of an input signal amplitude spectrum and an

average noise spectrum.

Claim 10 (Original): The noise suppression device as recited in claim 1, wherein at

least one perceptual weight is externally controlled or selected.

Claim 11 (Previously Presented): The noise suppression device as recited in claim 1,

further comprising: a noise similarity analyzer configured to obtain a coefficient based on a

noise similarity level of the input time domain signal, wherein the noise spectrum unit is

further configured to obtain the noise spectrum based on the coefficient and the amplitude

spectrum.

Claim 12 (Previously Presented): A method for noise suppression, comprising:

generating an amplitude spectrum from an input time domain signal;

generating a noise spectrum of the input time domain signal;

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determining a signal to noise ratio from the amplitude spectrum and the noise

spectrum;

controlling, based on the signal to noise ratio, a first perceptual weight and a second

perceptual weight;

subtracting from the amplitude spectrum a product of the noise spectrum and the first

perceptual weight controlled on the basis of the signal to noise ratio, to generate a noise-

removed spectrum;

multiplying the noise-removed spectrum by the second perceptual weight controlled

on the basis of the signal to noise ratio, to generate a noise-suppressed spectrum; and

converting the noise-suppressed spectrum to an output time domain signal.

Claim 13 (Previously Presented): The method as recited in claim 12, wherein the step

of controlling comprises:

increasing the first perceptual weight and the second perceptual weight at frequencies

with increased signal to noise ratios; and

decreasing the first perceptual weight and the second perceptual weight at frequencies

with reduced signal to noise ratios.

Claim 14 (Previously Presented): The method as recited in claim 12, further

comprising: modifying at least one of the first perceptual weight and the second perceptual

weight at a ratio of a high frequency power to a low frequency power of any one of an input

signal amplitude spectrum, a noise spectrum, and an average spectrum of the input signal

amplitude spectrum and the noise spectrum.

Claim 15 (Previously Presented): The method as recited in claim 12, further comprising: modifying the first perceptual weight and the second perceptual weight, based on a determination result as to whether an input signal is a noise component or an audio component.

Claim 16 (Previously Presented): The method as recited in claim 12, further comprising: performing fill-up processing, when a subtraction result of said spectrum subtracter is negative or zero, to a spectrum obtained by multiplying a third perceptual weight to a specified spectrum.

Claim 17 (Previously Presented): The method as recited in claim 16, wherein said specified spectrum is one of an input signal amplitude spectrum, a noise spectrum, and an average spectrum of the input amplitude spectrum and the noise spectrum.

Claim 18 (Previously Presented): The method as recited in claim 16, further comprising: modifying the third perceptual weight at a ratio of a high frequency power to a low frequency power of at least one of an input signal amplitude spectrum, a noise spectrum, and an average spectrum of the input signal amplitude spectrum and the noise spectrum.

Claim 19 (Previously Presented): The method as recited in claim 16, further comprising: controlling the third perceptual weight based on the signal to noise ratio.

Claim 20 (Previously Presented): The method as recited in claim 16, further comprising: adjusting the third perceptual weight in value through multiplication of a ratio of an input signal amplitude spectrum and an average noise spectrum.

Claim 21 (Previously Presented): The method as recited in claim 1, wherein the step of controlling comprises: externally selecting one of the first perceptual weight and the second perceptual weight.

Claim 22 (Previously Presented): The method as recited in Claim 1, further comprising: determining a coefficient from a noise similarity level of the input time domain signal,

wherein the step of generating the noise spectrum comprises: generating the noise spectrum based on the coefficient and the amplitude spectrum.

Claim 23 (Previously Presented): A noise suppression device comprising:

a time to frequency converter configured to perform frequency analyzation of an input time domain signal for conversion to an amplitude spectrum;

a circuit noise spectrum unit configured to obtain a noise spectrum of the input time domain signal;

signal to noise calculator configured to obtain a signal to noise ratio from the amplitude spectrum and the noise spectrum;

a perceptual weight controller configured to control, based on the signal to noise ratio, first and second perceptual weights;

means for subtracting from the amplitude spectrum a product of the noise spectrum and the first perceptual weight as controlled by the perceptual weight controller;

means for multiplying a spectrum obtained from the means for subtracting by the second perceptual weight as controlled by the perceptual weight controller; and

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a frequency to time converter configured to convert an output of the means for

multiplying to a time domain signal.

Claim 24 (Previously Presented): A noise-suppressed time domain signal generated

by a noise suppression method comprising:

generating an amplitude spectrum from an input time domain signal;

generating a noise spectrum of the input time domain signal;

determining a signal to noise ratio from the amplitude spectrum and the noise

spectrum;

controlling, based on the signal to noise ratio, a first perceptual weight and a second

perceptual weight;

subtracting from the amplitude spectrum a product of the noise spectrum and the first

perceptual weight controlled on the basis of the signal to noise ratio, to generate a noise-

removed spectrum;

multiplying the noise-removed spectrum by the second perceptual weight controlled

on the basis of the signal to noise ratio, to generate a noise-suppressed spectrum; and

converting the noise-suppressed spectrum to an output time domain signal.

Claim 25 (Currently Amended): A noise suppression device for suppressing noise

other than an objective signal contained in an input signal, comprising:

means for controlling first and second perceptual weights for use in performing

perceptual weighting, according to the input signal; and

means for performing a spectral subtraction on a signal corresponding to a spectrum

of said input signal, using said controlled first perceptual weight, and for performing a

spectral amplitude suppression using said controlled second perceptual weight about <u>another</u> <u>signal corresponding to</u> ~~an amplitude~~ <u>the</u> spectrum of said input signal.

Claim 26 (Currently Amended): The noise suppression device set forth in claim 25, ~~wherein~~ <u>further comprising</u>:

<u>means for controlling</u> the first perceptual weight ~~is controlled~~ in such a way as to let the subtraction amount increase with increasing signal-to-noise ratio; and

~~wherein~~ <u>means for controlling</u> the second perceptual weight ~~is controlled~~ in such a way as to let the amplitude suppression amount decrease with increasing signal-to-noise ratio.

Claim 27 (Currently Amended): The noise suppression device set forth in 26, ~~wherein the first and the second perceptual weights perform~~ <u>further comprising means for</u> <u>performing</u> perceptual weighting <u>with the first and second perceptual weights</u> according to the frequency of the spectrum of the input signal.

Claim 28 (Currently Amended): The noise suppression device set forth in claim 25, ~~wherein the first perceptual weight performs~~ <u>further comprising means for performing</u> perceptual weighting <u>with the first perceptual weight</u> according to a gradient in such a way as to let the subtraction amount decrease with increasing frequency of the spectrum of the input signal.

Claim 29 (Currently Amended): The noise suppression device set forth in claim 28, ~~wherein~~ <u>further comprising means for controlling</u> the gradient of the first perceptual weight ~~is controlled~~ in such a way as to become steep with increasing signal-to-noise ratio.

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Claim 30 (Currently Amended): The noise suppression device set forth in claim 25, ~~wherein the second perceptual weight performs~~ further comprising means for performing perceptual weighting with the second perceptual weight according to a gradient in such a way as to let the amplitude suppression amount increase with increasing frequency of the spectrum of the input signal.

Claim 31 (Currently Amended): The noise suppression device set forth in claim 30, ~~wherein~~ further comprising means for controlling the gradient of the second perceptual weight ~~is controlled~~ in such a way as to become moderate with increasing signal-to-noise ratio.

Claim 32 (Currently Amended): The noise suppression device set forth in claim 25, ~~wherein the first perceptual weight performs~~ further comprising means for performing perceptual weighting with the first perceptual weight according to a gradient in such a way as to let the subtraction amount decrease with increasing frequency of the spectrum of the input signal; and

~~wherein the second perceptual weight performs~~ performing perceptual weighting with the second perceptual weight according to a gradient in such a way as to let the amplitude suppression amount increase with increasing frequency of the spectrum of the input signal.

Claim 33 (Currently Amended): The noise suppression device set forth in claim 32, ~~wherein~~ further comprising means for controlling the gradient of the first perceptual weight ~~is controlled~~ in such a way as to become steep with increasing signal-to-noise ratio; and

~~wherein~~ further comprising means for controlling the gradient of the second

perceptual weight ~~is controlled~~ in such a way as to become moderate with increasing signal-

to-noise ratio.

Claim 34 (Currently Amended): The noise suppression device set forth in 25,

~~wherein~~ further comprising means for performing perceptual weighting with the first and the

second perceptual weights ~~perform perceptual weighting~~ according to the frequency of the

spectrum of the input signal.

Claim 35 (Currently Amended): A noise suppression method of suppressing noise

other than an objective signal contained in an input signal, comprising the steps of:

controlling first and second perceptual weights for use in performing perceptual

weighting, according to the input signal;

performing a spectral subtraction on a signal corresponding to a spectrum of said

input signal, using said controlled first perceptual weight, and a spectral amplitude

suppression using said controlled second perceptual weight about another signal

corresponding to ~~an amplitude~~ the spectrum of said input signal.

Claim 36 (New): A noise suppression device for suppressing noise other than an

objective signal contained in an input signal, comprising:

a perceptual weight controller configured to control first and second perceptual

weights for use in performing perceptual weighting, according to the input signal;

a spectrum subtractor configured to perform a spectral subtraction on a signal

corresponding to a spectrum of said input signal, using said controlled first perceptual weight;

and

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a spectrum amplitude suppressor configured to perform a spectral amplitude

suppression using said controlled second perceptual weight about another signal

corresponding to the spectrum of said input signal.